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Finance, water infrastructure, and the city: comparing impacts of financialization in London and Mumbai

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Finance, water infrastructure, and the city: comparing impacts of financialization in London and Mumbai

Fritz-Julius Grafe 

ABSTRACT

This paper examines how financialization changes the financial ecologies of urban water infrastructure provision, and the consequences of these impacts. It begins by illustrating the current state of research on the financialization of infrastructure, and then details the method for contributing towards this literature. A comparative approach, based on the financial ecologies of urban infrastructure, is introduced and explained. The changing financial ecologies of London (UK) and Mumbai (India) are presented by means of a twin approach that examines, on the one hand, new state-level initiatives that introduce municipal bonds into their respective countries, and, on the other, highly individualized financial constructs that aim to enable similar, large water infrastructure projects in the two cities. The findings include the importance of local knowledge and the expertise needed to translate these knowledges/risks between actors in the financial ecology. Faults in these processes lead to compromised decision-making, which is largely enabled by weak oversight. Closer scrutiny and more transparent tendering processes are recommended as policy tools to overcome these shortcomings.

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INTRODUCTION

financial markets were supposed to dovetail the underlying commodity markets, but today the tail wags the dog. (K. N. Vaidyanathan, Senior Fellow, Geoeconomic Studies, Gateway House; Gateway House: Indian Counsel on Global Relations, 2018)

The continuously increasing significance of the finance sector within the global economy has had direct consequences for cities across the world. Subprime mortgages, real estate investment trusts and tax increment financing are just some of the ways by which our cities have become subject to what we now commonly refer to as ‘financialization’. These practices have resulted in an accumulation not just of economic power, but also of social and political impacts that reshape our society.

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Today, these impacts are not yet fully understood because they affect the urban on multiple levels and differing timescales. Furthermore, the resulting effects vary across locations and contexts.

This paper makes the argument that these effects are magnified when examining infrastructures, as they are at the nexus between epistemological narratives of economic growth, urbanization and financial practices. Infrastructures define the use of urban space, they enable modern societies while at the same time they create constraints and division (cf. Angelo & Calhoun, 2013). According to Stephen Graham, infrastructures, in the urban context specifically: 'are at the heart of the ways in which cities act as the main centers of wealth creation and capital accumulation through extending their control and appropriation of labor power and of resources over distant territories, people and ecosystems' (Graham, 2010, p. 4). Thus, they are not only crucial to the economic impacts on urban development but also to society–environment relations as a whole.

In this regard and bearing in mind the close entwinement of the human metabolism with water, it could be argued that water infrastructure is one of the central prerequisites for the urban, spanning a rich history from river use to aqueducts to desalination plants. These Infrastructures are often invisible in the Global North, whereas in the Global South they are frequently objects of contestation. Both the visible and invisible domains are charged with a turmoil of power relations. The politics associated with water infrastructures reach from international resource conflicts to the micropolitics of managing access to a single public water tap (Graham et al., 2013). Since much of the aging water infrastructure in the Global North is in a dilapidated condition, and much in the Global South is yet to be built, the question of finance, for both construction and maintenance, is central for the futures of billions of urban dwellers.

This paper aims to answer the question of how financialization changes the financial ecologies of urban water infrastructure provision, and what the consequences of these impacts are. To understand better the patterns and dynamics of this process, it adopts a comparative approach, contrasting the evolving financial ecologies of water infrastructure provision in London and Mumbai. It aims to expose how the financialization of water infrastructure changes the relationships between key actors in the ecology, and how the role of local knowledge and its translation into different social contexts are central to this process. Understanding this process allows us to show how financialization influences long-term planning and decision-making and thus affects the capacity of our cities to adapt to future challenges.

FINANCIALIZATION OF INFRASTRUCTURE

Financialization at its most basic is commonly defined as 'the increasing role of financial motives, financial markets, financial actors and financial institutions in the operation of domestic and international economies' (Epstein, 2005, p. 3). The debate around the increasing financialization of cities has been discussed within the literature from several perspectives in recent years. Arguably, the concept of financialization first entered the urban discourse in the guise of David Harvey's spatial fix (Christophers, 2010, 2012; Harvey, 2006) and from there came into its own by application to a wide range of issues concerning the particular urban effects of financialization (Aalbers, 2017; Clark et al., 2015; French et al., 2011; Heeg, 2013; Leyshon & Thrift, 2007; Rutland, 2010; Savini & Aalbers, 2016). Perspectives include the financialization of urban development in terms of land (e.g., Kaika & Ruggiero, 2016), housing (e.g., Aalbers, 2017), redevelopment processes (Rutland, 2010; Weber, 2010), as well as urban infrastructure (O'Neill, 2013; Torrance, 2008).

This paper is particularly interested in the financialization of infrastructure. Adapting the definition of financialization to the urban context, we identify the increasing significance of financial institutions, an increasingly shareholder-oriented form of corporate governance, a more market-based capital supply and ongoing financial innovation as key characteristics (Rutland, 2010). In terms of financialization of infrastructure, the literature discusses these

characteristics with varying emphasis and outlines distinct differences from other processes of financialization in cities.

The growing power of financial institutions is marked foremost by increasing significance of specialized infrastructure investment funds and their particular modes of operation. Groups such as the Macquarie Group, Brookfield Asset Management and Global Infrastructure Partners are the established actors in this field, with institutions such as BlackRock and IFM constantly expanding their operations in the infrastructure sector (cf. Infrastructure Investor, 2018). Allen and Pryke (2013) emphasize the significance of Macquarie Group's model of infrastructure financing during their ownership of Thames Water and the resulting overleveraged balance sheet that overshadows future infrastructure investments (Loftus & March, 2017). From an institutional perspective, O'Neill (2013) emphasizes the remaining importance of the state (in its role as a guarantor of property rights) as a prerequisite for often legally complex infrastructure issues.

The importance of the shareholder value dimension is especially significant in the literature, as this shifts the focus from an asset's use-value towards its exchange value, completely changing the valuation process (cf. Callon, 1998). This shift towards a shareholder-oriented process can lead to compromised decision-making and externalization of costs into the future (Loftus & March, 2017). Furthermore, it often frames the interactions between regulator and operator and the viability of any regulatory mechanisms (Grafe & Hilbrandt, 2019). Appel & Kumar (2015) outline the wider dynamic between a prevalent epistemology of economic growth and the rise of infrastructure finance.

The changing landscape of capital supply for infrastructure provision, from either state- or bank-based sources to more market-oriented approaches, has been largely driven by austerity policies in the wake of the 2008 financial crisis and the ongoing liberalization of economies. O'Brien and Pike (2015) explore this dynamic in the context of UK City Deals and outline the difficult nexus of local capacities, state involvement and risk assessment. The consequences of market-based capital sourcing again become apparent when re-engineered balance sheets resulted in overleveraged entities that became constrained by their debt burdens (Grafe & Hilbrandt, 2019). Ahlers and Merme (2016) explore the effects of financialization on the water sector and outline the undemocratic tendencies of such processes and their potential impacts on social-ecological landscapes.

The infrastructure sector is subject to ongoing financial expansion and innovation. Securitization is expanding and pushing into all aspects of urban infrastructure. Municipal bonds are being introduced worldwide as novel mechanisms for financing infrastructure projects (Grafe & Mieg, 2019), and localized individualized financial constructs employ complex tax optimization structures that often foray into grey areas of international tax law (Grafe & Hilbrandt, 2019). Allen and Pryke (2013) explore the consequences of ring-fencing in the water sector and outline their effect on customers' bills.

Underlying these discussions of financialization is the ongoing debate on the significance of local knowledge for anchoring global financial capital in particular places. Most of these discussions centre around real estate development, such as Clark and O'Connor's (1997) discussion of mortgage-backed securities and the importance of local knowledge in the primary market as opposed to the securitized secondary market. Wood (2004) further emphasizes the role of local knowledge vis-à-vis globalized property finance, in its capacity to navigate local complexities such as political and administrative barriers. More recently, Halbert and Rouanet (2014) discussed the particular processes by which transcalar territorial networks translate local knowledge towards foreign investor expectations and thus filter the risks that would otherwise prevent the landing of global financial capital in Bangalore. They emphasize that, when actors 'collect data, unravel legal issues or shape representations of the new city, they invariably translate FFT's [foreign finance investors] expectations into the urban built environment' (p. 11). Local

knowledge and its translation thus play a central role in the anchoring of global financial capital in places with varying cultural practices and contexts.

In sum, the literature shows that the financialization of infrastructure is largely defined by a city's flows, enabled by their infrastructures and the financial sector's desire to securitize these revenue streams. O'Neill (2018) concludes that the capital, organizational and regulatory structures of particular projects are the key dimensions through which financialization takes hold of urban infrastructure and imposes its logic on their underlying flows.

METHOD

The paper builds on structured document analysis and recursive abstraction of 297 legislative and planning documents, reports, public statements and media coverage from the period 2001–18. The analysis is focused on documents that discuss financial markets and infrastructure in the given ecologies. The data were analysed in detail regarding the effects of financialization of urban infrastructure in order to identify patterns and conflicts and derive analytical categories thereof. Based on these categories, the material was re-examined to test observer impressions. This document analysis was supplemented with 22 expert interviews conducted between 2015 and 2018.

Recent developments in comparative urbanism offer new means for theory generation that are both regionally embedded and sophisticated enough to allow for theoretical abstraction. The works of Jennifer Robinson (Robinson, 2011, 2014) and Colin McFarlane (McFarlane, 2006, 2010) set an agenda that aims to eliminate the parochialism of urban theory by overcoming the North–South divide in theory generation as well as emphasizing urban experiences that go beyond economic indicators. This allows analysis of the impacts of finance–infrastructure dynamics found not only in cities dominated by formal economies and fixed built environments, but also in those shaped by an informal economy. The latter will allow insights into how finance has the potential to affect the majority of present and future urban dwellers. Central to this methodology is selecting appropriate units of comparison that avoid territorial definitions of the city, thereby allowing the inclusions of networks and flows within the analysis. The units of comparison in this particular case are the two financial ecologies of water infrastructure provision in London and Mumbai; this includes their spatial configurations, stakeholders and connections. With these units of comparison defined, appropriate methods of data generation are applied.

In this paper, the units of comparison are conceptualized as the *financial ecologies of urban infrastructure*. A more detailed discussion of the benefits of using financial ecologies as a method can be found in a previous issue of this journal (cf. Grafe & Mieg, 2019). To summarize: the concept of ecologies is picked up in several papers examining the finance–infrastructure nexus (French et al., 2011; Monstadt, 2009; Swyngedouw, 2009), where it is important to note that ecology in these works mostly refers to Abbott's (2005) understanding of the term, where he contends that “Ecology” ... names a social structure that is less unified than a machine or an organism, but that is considerably more unified than is a social world made up of the autonomous, atomic beings of classical liberalism’ (p. 248). In Abbott's conception, three main components make up these ecologies: their respective actors, their locations, and their associating relations. Interlinkages of these ecologies can be formed via ‘hinges’; that is, a strategy that provides results to allies in other linked ecologies and ‘avatars,’ which are considered a colony from one ecology within another (pp. 245–255).

This concept will be the basis for the comparison, as it will help to delineate the financial ecologies of urban infrastructure in the two cities. This will enable us to compare the particular arrangements of actors, locations and relations with their individual subjectivities, knowledges and practices intact. It also facilitates linking these local configurations to the financial system, and reveals how financialization interacts with the development, governance, and maintenance of urban infrastructures. One of the benefits of this approach is a more nuanced understanding

of the impacts of financialization on cities, as it looks beyond the built environment as an empirical surface for the anchoring of global financial capital (cf. Grafe & Mieg, 2019).

Furthermore, within each city a twin approach will be applied, initially examining new state-level initiatives that introduce municipal bonds to their respective countries. This is done to understand the trajectories of national financialization initiatives within the ecologies, and how these state programs reshape their configurations. Second, highly individualized financial constructs that aim to enable similar large water infrastructure projects will be examined. This outlines how the private sector extends the financialization of urban water infrastructure and how these individual practices affect the ecologies. Together, these two dynamics represent the key changes currently affecting the financial ecologies of urban infrastructure provision. They portray changing processes across different scales and exemplify how a financial ecology's configuration becomes altered, resulting in both immediate local impacts and long-term structural changes.

FINANCIAL ECOLOGY: LONDON

The financialization of infrastructure provision in the UK is a wide and varied subject; we will focus here on two key aspects that define the evolving financial ecology of urban infrastructure: the first is the attempt to introduce municipal bonds as a new measure to finance infrastructure projects under austerity policies, whereas the second examines a 'tailor-made' project finance construct, by example of London's Thames Tideway Tunnel.

The financial ecology

As mentioned previously, the financial ecology of urban infrastructure provision is first and foremost defined by its set of actors, their relative locations and their respective relations. These form the core of the financial ecology which is then in turn linked to other relevant ecologies.

The financial ecology of urban infrastructure provision in the UK is defined by two core dynamics: first, the fallout from the wave of privatizations in the water sector since the late 1980s, and ongoing austerity policies as a consequence of the 2008 financial crisis. This climate is exacerbated by a financial climate of uncertainty due to ongoing and convoluted Brexit process. It is in this unfavourable economic climate in which the Public Works Loan Board (PWLB) is primarily responsible for providing capital for infrastructure development. As a consequence, public-private partnerships by means of private finance initiatives have become a common mechanism for realizing the most pressing projects. The public is largely unaware of these dynamics, except in cases of breakdown and environmental degradation, which for investors and politicians often eases the process of greenlighting potentially contentious projects. Knowledge of and about the infrastructures is mostly well kept by responsible institutions, and officials and engineers often consider themselves members of a long and well-established tradition of public engineering.

The following section describes this ecology in more detail by exploring the two aforementioned angles that illustrate its changing dynamics.

The UK and the introduction of municipal bonds

Municipal bonds find their way into the ecology of UK infrastructure finance as a direct consequence of the 2008 financial crisis, after which they were introduced as a measure to reduce government spending in the face of austerity politics. In a climate of tight public budgeting, semi-successful public-private partnerships, rising interest rates for infrastructure projects, and the fall-out of widespread privatizations of public assets since the late 1980s, municipal bonds are intended as a tool to empower municipalities to access new sources of capital for public works.

Institutionally, the municipal debt market was initiated by the founding of a national Municipal Bonds Agency (UKMBA) in 2014 (LGA, 2014), effectively establishing an avatar of the

financial industry in the ecology of urban infrastructure provision (cf. Grafe & Mieg, 2019). The UKMBA is owned by local councils and the Local Government Association. Within this ecology, as a parallel structure to the PWLB, the UKMBA considers its main aim to be the provision of loans at lower interest rates than those provided by the former. Municipal bonds are the financial asset intended to fulfil this function, which will largely depend on legal and financial mechanisms such as the pooling of borrowing requirements and a formalized credit assessment process (UKMBA, 2015). Furthermore, the agency provides services such as facilitating inter-council borrowing and the provision of expertise to councils during negotiations with lenders.

The success of the UKMBA so far is muted. Comparatively few local authorities have joined the agency and the first bonds are yet to be issued. Comments such as that only 'first class, highly rated councils' can participate, as well as improving interest rates at the PWLB, have held back the establishment of a successful bond market thus far (Public Finance, 2016, p. 1). Furthermore, the complexities of the legal and administrative challenges in fulfilling these functions have been widely underestimated. This situation is further emphasized by the fact that the task of assessing and translating risk and credit quality is also problematic when only few ratings have been made public thus far. All this leads to a certain level of hesitancy on the part of investors, which has stunted the progress of municipal bond markets in the UK.

The financial ecology is, however, fundamentally changed: the establishment of a parallel structure for infrastructure funding opens the door to new actors and relations, as well as the establishment of a new, permanent avatar. This avatar provides new expertise and practices to the councils, which also help it to engage with financial markets beyond municipal bond projects. The establishment of the municipal bond market is still a political project, which is pushed both by politicians and investors alike, as a means to provide funding for much needed infrastructure projects and to establish new investment opportunities for excess liquidity of long-term investors.

The Thames Tideway Tunnel and private-sector activities

The advancement of municipal bonds is only one aspect in which financialization takes hold of the financial ecology of infrastructure provision. The second development of note is the emergence of project finance, individual localized often heavily financialized infrastructure projects that develop their own financing schemes, intended to help realize infrastructure projects. A case in point is the development of London's Thames Tideway Tunnel or 'super-sewer', a massive engineering project that aims to stem the discharge of sewage overflows into the River Thames by constructing a 25-km tunnel as a temporary storage facility beneath the river.

The central actor with initial responsibility for this project is Thames Water, which is the 'UK's largest water company, with 13 million customers in the South-East of England, of which just under 9 million rely upon them for their water supply' (Allen & Pryke, 2013, p. 419). It is regulated by Ofwat (the Water Services Regulation Authority), whose main responsibility lies in the negotiation of tariffs every five years based on Thames Water's business plans and Ofwat's internal Regulatory Assets Base Model (RAB). Thames Water was privatized in the early 1990s during a wave of privatizations across the UK and has since undergone several takeovers and restructurings, resulting in lower ratings – mostly due to overleveraging of the underlying assets to finance said takeovers. Many public utilities in Britain that were privatized since the late 1980s were at first listed on the London Stock Exchange, but have since become unlisted and have commonly adapted some sort of offshore structure that further obfuscates transparency (Blaklock, 2017). Such is the case for Thames Water, which in 2012 had 10 corporate layers between shareholders and the licenced water company, with some subsidiaries taking advantage of tax havens (Thames Water Cayman Island Finance Ltd holds over half of Thames Water's £10 billion long-term debt). Thames Water is ultimately owned by Kemble Water Holdings Ltd, a consortium of international infrastructure and pension funds, while its financial model is principally one of debt refinancing based largely upon the securitization of

household revenue streams (cf. Allen & Pryke, 2013). Blaiklock (2017) states that, contrary to common investment principles, customers pay both during the construction period as well as during service delivery, which essentially transfers the project completion risk from utility to customer. Blaiklock concludes that ‘the incentive for contractors to achieve project completion to time and cost is now much diminished, if not eliminated. Furthermore, customers cannot manage, control or mitigate such risks’ (p. 4).

Project delivery is to be implemented by Bazalgette Tunnel Ltd (BTL) as an infrastructure provider, a new special-purpose company with an offshore holding structure that keeps the project separate from Thames Water’s balance sheets, largely as a consequence of the latter’s weak financial position due to still looming acquisition debt. BTL is backed by several long-term investors such as pension funds, Allianz, Amber Infrastructure Group, Dalmore Capital and DIF. A proportion of the project costs is to be passed on to Thames Water’s customer bills, with an estimated £25 added per annum in the mid-2020s. BTL received its operating license from Ofwat in 2015. This establishes a set of relationships between the central actors in this ecology that is largely defined by debt dependencies to external actors.

Outside of this core dynamic, several practices outline the power dynamic between the central actors, the public and academic research. The first of these is the rather uncompetitive tender process, which attracted only two bids. Another controversy is the fierce debate around the Thames Tideway strategic study, where some researchers see the first option of sustainable urban drainage systems (SUDS) as a more feasible and sustainable solution (cf. Clean Thames Now and Always, 2016). This critique is reinforced by the differing levels of resources allocated to researching the four potential strategies, and the lack of any updated research since, as well as the brushing aside of uncomfortable independent insights that question the need for the project as a whole (Blaiklock, 2017). The latter issue is further emphasized by the 2010 Flood and Water Management Act, which now emphasizes SUDS and could cause the tunnel to be redundant in 10–12 years. Another criticism is the explosion of costs to about five times the original estimate, while the debt/equity ratio of Thames Water is criticized for overtly benefitting investors (Blaiklock, 2017). A further critique is that the underlying infrastructure was poorly maintained over the years, and that it would be perfectly capable of managing the discharge volumes if maintained properly (Blaiklock, 2017; Clean Thames Now and Always, 2016). The limited consideration of climate change impacts and long-term developments outside of population growth are also commonly criticized. Loftus and March come to the following conclusion about the efficacy of the Tideway Tunnel and its effects on London:

Here we find a coalition of institutional investors able to assemble different aspects of London’s hydrosocial cycle into a vast machine for making profits. Financial and political interests come to be integrated into an elite fix that will generate returns for the pension funds, insurance companies and sovereign wealth funds now integral to the hydrosocial cycle of the city. Rather than an ambitious project to avoid a polluted Thames, generate clean energy, and build creatively on the challenges of the water–energy nexus, the Thames Tideway Tunnel is a concrete tunnel for extracting rents, a pure financial asset. (Loftus & March, 2017, p. 14)

The project and its set-up thus become a successful hinge for providing results to allies: they extract profits and transfer them to external actors. Drawing together the dynamics of establishing municipal bonds and project finance, we can identify the emerging trajectory for the ecology of urban infrastructure provision in the UK.

FINANCIAL ECOLOGY: MUMBAI

The financialization of infrastructure provision in India is a more complex subject than the processes at play in the UK. Here, we again employ two key aspects as a lens through which to

explore the evolving financial ecology of urban infrastructure development: the first focuses on the introduction of municipal bonds to finance infrastructure projects in overburdened and underfinanced cities, whereas the second focus again examines an exemplary project that is defined by its individualized financial set-up and resulting complications.

The financial ecology

The current ecology of water infrastructure provision is defined primarily by a single dynamic: an immense need for infrastructure development in the face of an enormous investment gap. Actors such as the World Bank and Asian Infrastructure Investment Bank (AIIB) aim to fill this gap by injecting foreign currency. The World Bank has been an especially significant player in early efforts to do so, which has not been without controversy and resulted in a shift in its priorities towards privatization (cf. Bakker, 2013). A certain air of expectancy of imminent privatization of water utilities in this period, particularly in Mumbai, paralysed any further investment and expansion of existing systems, resulting in the degradation of infrastructures, regulators, and institutions (cf. Björkman, 2015). Mumbai's ambitions to become a 'world class city' in the image of Singapore have particularly strained the transition from old established systems to newer digital ones, losing crucial expertise and knowledge in the process of a forced transition. It is against this background that the government seeks to enhance its own spending through new avenues for capital generation. The most common practices for infrastructure provision are currently reliant on state funding through initiatives such as the Jawaharlal Nehru National Urban Renewal Mission (2005–12) and, most recently, the Atal Mission for Rejuvenation and Urban Transformation (2015–present) with a focus on public–private partnerships.

Beyond these dynamics, cities are often characterized by political tensions between an emergent middle class and more recent arrivals. Anand (2017) concept of 'hydraulic citizenship' helps unpack practices of unequal distribution – based on particular forms of citizenship, belonging and connection that define to a large degree the public debate around water infrastructure projects. Gandy (2008) discusses this dynamic for the case of Mumbai and gives the wider historical context of the colonial roots of Mumbai's water issues. This sets an important frame for the financial ecology of urban infrastructure development, in which the public plays a much more present and involved role than in the London case. From the perspective of investors, it is the difficulty of evaluating risk and complexity to a satisfying degree that most often deters them from committing to long-term infrastructure projects, especially when comparable but less risky assets such as government bonds are available. This complexity adds up to a playing field in which a plethora of consultants thrive: from engineering to project management to business to finance to non-governmental organizations (NGOs), consultants of all stripes promise to cut through the complexity and get things done. The role of knowledge of and about the existing systems becomes the crucial nexus of interaction between the actors: consultants market the supposedly needed knowledge; citizens blame a supposedly corrupt state apparatus for abusing a perceived knowledge monopoly; investors seek knowledge that translates to their metrics; and public officials struggle to transform local knowledges at all levels into formal, accessible information for all actors.

The following section explores this ecology in more detail by outlining two cases that exemplify current dynamics.

India and the introduction of municipal bonds

Municipal bonds in themselves are still a relatively new instrument in India, with municipal bonds for infrastructure financing in India originating directly from a United States Agency of International Development (USAID) programme that ran from 1994 to 2010. The Financial Institutions Reform and Expansion Debt (FIRE-D) programme primarily seeks to support the Indian government in strengthening domestic capital markets to expand their capabilities as sources of development finance, with a particular focus on the relationship between debt

markets and infrastructure by emphasizing ‘development and financing of commercially viable urban environmental infrastructure projects; by channeling USAID Housing Guaranty funds to selected demonstration cities and states; and through policy advocacy, management support, technical assistance, training and research’ (cf. USAID, 1998, p. 4). This first aim, to increase the capacity of India’s cities and to raise and allocate financial resources, was tied to the improvement of urban water and sanitation services, with one main strategy being to pursue the establishment of a market-based municipal bonds market in cooperation with national, state and local governments.

Within this framework the first taxable municipal bond was issued in 1997 in Bangalore, followed by the first tax-free municipal bond in 2002 in Ahmedabad. These first issuances were followed by sharp incline in issued bonds until 2005, followed by a decline and end towards 2010 (cf. Chakrabarti, 2014; Vaidya & Vaidya, 2008). This coincides with the lifetime of the FIRE-D programme, under which a total of 25 municipal bonds were issued, mostly for water infrastructures. Valued at a total of US\$2 billion through taxable bonds, tax-free bonds and pooled financing, there remains a large unfilled gap compared with the projected urban growth and need for US\$835 billion of infrastructure investment (this is roughly half of India’s 2012 gross domestic product (GDP), while public expenditure is estimated at only 1.5% of GDP) (cf. Chakrabarti, 2014; Vaidya & Vaidya, 2008). Key dynamics within these projects include the advantageous position of larger municipal corporations vis-à-vis smaller ones by means of higher property tax income and institutional capacities, which still is not enough to overcome low ratings, unclear regulation at different levels and political uncertainty. Smaller municipalities rely on pooled schemes backed by state guarantees, but still suffer from the same factors and resulting investor hesitation.

Sheikh and Asher (2012) distinguish supply- and demand-side problems. On the supply side, fiscally healthy municipalities often become bogged down by statutory obligations, resulting in underspending and an inability to take on debt. This is exacerbated by a lack of revenue sources that could offset potential debt and unpredictability of large government interventions, such as the Jawaharlal Nehru National Urban Renewal Mission, which effectively pushed aside several municipal bond initiatives. Furthermore, a lack of localized expertise leaves municipalities unequipped to engage efficiently with markets. On the demand side, the authors outline general market conditions in India, which are currently unfavourable for municipal bonds, which also often prove to be illiquid assets due to a lack of secondary markets (Sheikh & Asher, 2012). This is further emphasized by a lack of reliable information, as municipalities practice a culture of non-disclosure. Also, there remains confusion on a legal level: regulatory oversight and processing of defaults is convoluted, which results in an overall evaluation of municipal bonds as somewhat risky investments (Vaidya & Vaidya, 2008).

Consequently, the state attempts to resurrect the municipal debt market by issuing new Securities and Exchange Board India (SEBI) regulations, which enable the direct listing on stock exchanges, include further obligations for municipalities to contribute at least 20% of costs, prove a track record of at least three years of positive balance sheets; and improve informational flow from municipalities (SEBI, 2015). This is to result in at least investment-grade bonds.

Politically, municipal bonds remain high on the agenda as a fix to India’s infrastructure problems, with Prime Minister Modi himself pushing for their implementation at the inauguration of the National Institute of Securities Markets campus at Patalganga (Modi, 2016):

You are all aware of the huge capital requirements for improving urban infrastructure. This government has launched an ambitious Smart Cities programme. In this context, I am disappointed that even now, we do not have a municipal bond market. There will be problems and difficulties in creating such a market. But the true test of an expert innovation is when it solves a complex problem. Can SEBI and the Department of Economic Affairs ensure that at least 10 cities in India issue municipal bonds within one year?

The Mumbai Sewage Disposal Project (MSDP) and private-sector activities

As with the previous case, this section expands the perspective on the financial ecology of infrastructure provision by example of a specific project and an analysis of its particular financialization. The MSDP will provide the case for this analysis, focusing on the latest developments related to MSDP-II. The project is especially relevant for present purposes because it addresses the same issues as the London Tideway project: its main aim is to overcome overwhelming sewage discharges and associated problems by increasing the capacity of the Water Supply and Sanitation Department (WSSD) of the Municipal Corporation of Greater Mumbai (MCGM). MSDP-II is an ambitious effort that includes the construction of two major conveyance tunnels and improvement and construction of seven treatment plants based on projected needs in the year 2025, with an overall cost projection of about US\$850 million (cf. Gupta et al., 2017). Furthermore, the overall MSDP project seeks to ‘Sustain ... the financial viability of the provision of water supply and sewerage services in Brihan Mumbai through direct charges to beneficiaries at appropriate levels’ (World Bank, 2004, p. 2).

The selection of a case from Mumbai is especially relevant to the theme of financialization, as the city is India’s financial capital, which besides its relative wealth and access to capital faces major problems in overcoming its infrastructural problems. Björkman (2015) explains in great detail how this particular position on the subcontinent resulted in an expectation that the water system would be privatized, thereby paralysing the WSSD for an extended period and substantially contributing to the present precarious state of the city’s water infrastructure.

Mumbai’s sewage system was created at the height of the British Raj in the late 19th century, with occasional extensions as the city grew. The first efforts to integrate and coordinate the system go back to the 1970s, when the first stage of the MSDP-I project was implemented under the supervision of the World Bank and included MCGM’s first master plan for the sewerage system, issued in 1979. This plan divided Mumbai into seven sewerage zones that operate independently with their own treatment facilities. MSDP-I was completed in 2003 (cf. World Bank, 2004). The extension and evolution of this project is referred to as MSDP-II.

The central actor in MSDP-II is the WSSD, which at the behest of the MCGM manages the tendering processes and implementation, while initial finance is provided through Modi’s Atal Mission for Rejuvenation and Urban Transformation (AMRUT). AMRUT is a state-level initiative that seeks to boost water infrastructure development in Indian cities by means of public–private partnerships. The AMRUT Guidelines section on financing explicitly suggest a flexible approach in acquiring the overall needed capital, this includes an acknowledgement of the fact that costs should be passed on to the public in the form of different loan mechanisms:

Different sources of finance have to be identified. At the ULB level [Urban Local Body], the contribution from internal sources (e.g., taxes, fees, others), external sources (e.g., transfers from States, project fund from Central/State Governments, others) and possibilities of debt, bonds and others has to be assessed. The challenge is to motivate citizens to share the additional cost. One way is to take a loan for project funding for a locality and repay the loan through an increase in property taxes for, say, 10 years in that locality only. This is called Tax Increment Financing (TIF). (MOUD, 2015, p. 13)

This sets the stage for the different tendering processes through which the WSSD hopes to implement the different subprojects of the MSDP-II, and the level at which individual projects either come to life or wither. Overwhelmingly, the latter has become the common case, with the 2017 CAG report critically concluding that:

It was observed that there was no monitoring mechanism in MCGM to ascertain the progress of the implementation of the Master Plan. There was failure of MCGM in awarding any single contract

after lapse of nine years indicated lack of pursuance of preparatory works such as, resolving land issues, obtaining required statutory clearances from [the Ministry of the Environment and Forests] and finalizing technological/capacity issues of [waste water treatment facilities] etc. MSDP incurred 141.78 crore on designing works and no capital work could be commenced for want of preparatory works. (CAG 2017, pp. 94–95)¹

A central aspect in this development was the involvement of an international consortium of advisers led by the project management consultancy Mott MacDonald, which struggled to deliver progress on the project in the first nine years, following two extensions of their contract. This resulted in a blame game between consultants and politicians in which the former blame political complications and the absence of environment clearance for the lack of project progress, whereas politicians blame inappropriate advice and the consultants' preoccupation with maximizing their own profits as the key roadblocks (*Mumbai Mirror*, 2018). This resulted in steps to blacklist the consultancy from any further projects in the region. Furthermore, minor projects such as canal works and rescue pit constructions were characterized by financial irregularities, overpayments, cost inflations and faulty designs, resulting in further blacklisting of contractors (CAG, 2017; MCGM, 2018). This situation, together with the major delays, has resulted in underperformance of the infrastructure itself as well as major cost increases, from an estimated Rs2300 crore in 2006 to Rs14,368 crore in 2018 (Pillai, 2018).

After a decade, the Colaba treatment plant is currently the only major work that has made some progress, the tendering process for which began in May 2011 and was finalized in July 2016, following lengthy delays 'due to deviations in design parameters proposed by the PMC [Project Management Consultant]' (CAG, 2017, p. 91). The tender for the plant was awarded to Suez SA, a publicly traded French utility company that generated a revenue of €15.1 billion in 2015. The contract includes design and construction over three years and subsequent operation for 15 years, with projected revenue for Suez of €42 million (Suez, 2016).

ANALYSIS: A COMPARISON

Having established the respective financial ecologies and their current dynamics in the two cities, we have defined the units of comparison for the comparative analysis (cf. Robinson, 2011). The following section will proceed with their comparative examination, paying particular attention to the configurations of actors within the ecologies as well as their connections linking them to external networks and flows. This eschews territorial definitions of the cities and emphasizes the relational dimension of their financialization.

The Municipal bond dynamic

As the case of municipal bonds in the UK shows, the introduction of a municipal bond agency establishes a new avatar in the financial ecology of infrastructure provision, whose main objective is the opening up of new sources of capital at lower interest rates (i.e., compared with those offered by the PWLB). In the case of India, the motivation is the same desire for a cheaper source of capital, but the role of the avatar of the financial industry is assumed by the World Bank. Both these institutions assume the role of facilitators who bring investors and cities together through financial innovation. These avatars support municipalities with expertise in accessing financial markets, on the one side, and in translating local complexity into assets the market can evaluate, on the other. Therefore, they have a crucial role in negotiating risk, both financial and political, for both sides. They differ with regard to the amount of power they hold over defining the legal framework for new bonds: As a publicly owned institution, the UKMBA has more leverage on legislative measures to enable mechanisms such as pooled finance schemes, whereas the World Bank as investor and counsellor had only indirect influence in formulating policy. It is important

to note that the World Bank has since withdrawn from this position, which leaves the Indian ecology without a central avatar managing and coordinating the advancement of the municipal bond market. SEBI, the regulator of the Indian securities market, has since assumed some of these responsibilities and pushed regulatory frameworks towards establishing municipal bonds. As mentioned previously, the municipal bonds themselves act as hinges providing results to allies in the financial industry in their respective ecologies. The links they create have the effects of investing capital, extracting profits and introducing new outside interests into the ecology. In both cases, municipal bonds establish new parallel structures within their ecologies, affecting relationships but not yet succeeding in reconfiguring established sets of relations between key actors. As was shown, this is partly dependent on factors that lie outside of the ecology, such as market dynamics and support for the scheme at the national level. Municipal bonds hence propose a semi-fixed model for the capital structure of infrastructure developments; this often proves too inflexible to adapt to the underlying fluidity produced by constant readjustments of the organizational structure, which tries to quantify the often dynamic and contested knowledges on the ground. Within the ecology, the crucial role is assumed by the avatars and their ability to translate risk between parties and actors and establish a common knowledge base on which further practices can be based.

The project finance dynamic

This structural expansion of the national financial framework for urban infrastructure provision carried out by these new avatars is accompanied by a less centralized processes of financialization that has immense impacts on the financial ecology of urban infrastructure provision, namely the highly individualized financial constructs that enable the largest-scale projects. The following section describes how these affect the financial ecology.

The Tideway case exemplifies how a highly adapted and heavily financialized project framing defines relationships between actors and locations in the financial ecology. The case shows how, in the earliest stages of project planning, financial interests have significant influence on the process of establishing the most viable solution for the problem at hand. First, asymmetric funding of research into viable solutions predefined the preferences for technocratic, large-scale engineering efforts, which are more easily ring-fenced and securitized than decentralized and more environmentally integrated solutions. Furthermore, the project exemplifies widespread conflicts of interest in the rather small world of large-scale infrastructure development and financing, which are often defined by the professional biographies of key actors and their professional networks. All this was exacerbated by a weak tendering process involving only two applications. This exposes an existing power asymmetry in the financial ecology between local political representatives, regulators, academia, service providers, contractors and investors from the start, in which decision-making on the local level is already compromised.

Similarly, Mumbai's ongoing efforts to improve its sewage system show how financialization takes hold of the financial ecology: having failed as an object of privatization, the state actively promotes heavily financialized development of the infrastructure system by pairing the AMRUT funding scheme with ample windows of opportunity for individual financialized solutions. However, the problem within the ecology does not lie with the availabilities of flexible capital structure models, but with the availability, quality and evaluation of knowledge regarding the underlying infrastructure system and resulting plannability for proposed projects. International consultancies are vying to fill this void, but have yet failed to cope with local complexities. Here too, conflicts of interest abounded, ultimately resulting in the blacklisting of multiple contractors. The progress on the Colaba treatment plant exemplifies the preference for large-scale, clearly ring-fenceable projects that have minimal and clearly defined points of interaction with the existing system. An essential point of difference is the much greater public awareness

and scrutiny that go along with any water issues within the city, resulting in even more red flags that deter potential investors.

The tendering process and regulation

Both cases exemplify the importance of the tendering process in defining relations between actors over the course of the project, as this is the greatest lever on the administrative side to determine the organizational structure of the project. It is the central moment in which the level of financialization and the future configuration of the ecology is determined. Infrastructure investors favour safe, long-term investments that provide a steady revenue stream in order to spread their risk, which incentivizes politicians and administrators to optimize their prospective projects to fit this mould in order to attract investment in projects that might otherwise not be considered viable. The consequences are a regionalization of market risk into the municipalities and often the sidestepping of public debate in order to circumvent potential project hold-ups. Here, the Mumbai case provides a valuable lesson for the global North: the public scrutiny on urban water issues secures a certain level of transparency, that would surely benefit tendering processes in the Global North.

The regulatory structures in both cases further outline the power asymmetry in the ecology: In London's case, the offshore capital structure of Thames Water and its withdrawal from the stock exchange greatly reduce transparency for regulators, while Mumbai's overburdened and disintegrating institutions fail to monitor potential progress that might be made. Furthermore, regulatory measures are largely toothless in face of the fact that these large utilities are 'too big to fail', and that their continued success is in the interest of the regulator even in the face of alleged mismanagement. These financial ecologies of urban infrastructure provision are characterized by a power asymmetry between actors, where, on the one hand, government agencies seek to woo investors to support less attractive projects by providing favourable incentives, while, on the other, investors prefer to cherry-pick, shape and fast-track those projects that best fit their portfolios. In the terms elaborated by O'Neill (2018), these processes significantly influence how the changing financial ecologies redefine the capital, organizational and regulatory structures of urban infrastructure projects.

DISCUSSION

Patterns of financialization of urban water infrastructure

In using financial ecologies of urban infrastructure as a tool for comparative analysis of increasingly financialized urban water infrastructures, we can abstract certain patterns that occur in both contexts:

First, local knowledge defines the interactions and power structure between the different actors in the financial ecology. The role of the avatars as translators of these knowledges is a key dynamic in determining the financialization process. It is new financial market expertise that is introduced via the avatars into the ecologies, in which the same avatars then take on the role of evaluating and abstracting local knowledges about water system into quantifiable metrics that set the guidelines for determining what sort of project is viable. It is this constant translation of political, financial, social, and environmental risks into categories that the respective actors can understand and evaluate.

Second, this translation process and resulting informational flow is not equal, transparent, or successful between all actors, which can lead to power asymmetries in the decision-making process, in which particular biases can tilt the project in a preferred direction from its outset. This translation process is particularly compromised in the context of highly individualized financial constructs, as here the connections are more akin to hinges than to fully formed avatars, as they are less clearly defined and not necessarily accessible to all actors. This is one of the main

mechanisms by which water infrastructures become subject to financialization, and both these findings speak directly to the ongoing debates on the importance of local knowledge in anchoring global financial capital, where Halbert and Rouanet's (2014) work in particular provides an excellent point of connection for a more in-depth analysis on how different forms of knowledge are instrumentalized in the financialization of urban infrastructure. It is important to note that the findings presented here emphasize even more the role of local knowledge in the context of urban infrastructure provision, as interaction with existing systems and practices adds several more layers of complexity than those existent in the real estate sector.

Third, the inherent logic of market-based infrastructure provision prioritizes financial risk assessments over political, environmental or social risks, which leads to a bias of actors representing the financial sector towards projects that minimize financial risk. This leads to preferences for large-scale infrastructure projects that are ring-fenceable and have limited and clearly defined points of interaction with the existing water system. This makes it easier to calculate, issue and sell a financial asset that represents the underlying infrastructure. As a consequence, cherry picking of particularly easily securitizable infrastructure projects prevails, and decentralized, highly integrated approaches appear less attractive. This also holds true for the financial asset level, where aggregated infrastructure securities aim to spread risks (e.g., aggregated municipal bond offerings in UK and India) but fail to attract attention in a competitive market. An added factor is the remaining status of a fledgling parallel structure for funding infrastructure, in which risk is also generated by unpredictable state initiatives that could completely upset the market. This third pattern speaks to the two strands of literature, which concern themselves with the increasing significance of shareholder value in decision-making and more general debates on the consequences of market-based capital provision. Findings support both Ahlers and Merme's (2016) analysis, as well as Loftus and March's (2017) contribution and strengthen the argument of compromised decision-making under a predominantly economically biased paradigm of urban infrastructure provision.

Finally, the compromised position of oversight and regulation becomes apparent: financial innovation to securitize revenue streams for the infrastructure sector thrives on obfuscation and lack of transparency, as tax optimization benefits from offshore structures and withdrawal from stock exchanges limits reporting obligations. This is further emphasized by the notion that the infrastructure operators are also largely considered to be 'too big to fail' and are thus subject to the same moral hazard that played a significant role in the past financial crisis. As a result, operators overleverage their assets, as regulators have no political interest in withdrawing licenses and crashing the water system per se. In the long term, this structural asymmetry has dire consequences for the financial ecology's main objective: providing urban water infrastructure. By continuously overemphasizing financial interests and their focus on the exchange value of infrastructures (by means of potential for securitizable revenue streams), their actual use-value and purpose become neglected. This skewed duality introduces immense temporal complexities, where horizons of financial calculus disconnect from the needs for long-term, sustainable infrastructures (Grafe & Hilbrandt, 2019). The findings presented here speak both to Allen and Pryke's (2013) work on ring-fencing in the water infrastructure sector in particular, but also to the more general debate on financial innovations and the causes of financial meltdown in 2008 (cf. Financial Crisis Inquiry Commission, 2011). This nexus of financial innovation beyond oversight, and the resulting risk in geographic terms, is a research area that is still underdeveloped.

Establishing the ground rules and looking ahead

If we relate these patterns to O'Neill's (2018) dimensions of infrastructure financialization, we realize how capital, organizational and regulatory structures are indeed the central avenues through which financialization progresses; however, we also see that these presuppose the

groundwork of parsing local complexity, establishing secured knowledge and translating it in such a way that it can enable these dimensions to take hold. This dynamic of knowledge and the resulting configuration of actors within the ecology defines the ground rules upon which the interplay of capital, organizational and regulatory structures unfold.

This points us towards the tendering process as the central lever in how regulators and the public can maintain more control over infrastructure projects and their long-term impacts. A strong and clearly defined tendering process not only benefits the city and its population in the long run, but also makes it easier for investors to ascertain local complexity and propose more appropriate solutions. In this context it is important not only to be critical of financialization and the machinations of capitalism, but also to enable cities to navigate the changing environment in which they must find ways to provide these essential services. A more proactive approach, such as that taken by the UKMBA and SEBI, provides some measure of public supervision and capacity-building, as opposed to individualized constructs that maximize their profits on the basis of moral hazard and obfuscation.

The much more public debate, which is a common subject in Indian newspapers in the second case, is a positive example of how public engagement can hold decision-makers accountable. This is sorely lacking in the British example, where public awareness often only begins when projects are a fait accompli, if at all. Making a case for increased visibility of infrastructure development and maintenance in the Global North would ensure greater transparency in the decision-making process and also shift the overly economic bias within it towards a broader debate around the environmental and social aspects of infrastructure development, closely aligned with the more embedded understanding of infrastructure provided by Angelo and Calhoun (2013) as well as Graham (2010).

For our understanding of financialization we have identified the central role of different knowledges and their translations, and how clearly defined institutional roles and powers can facilitate better outcomes for cities. With more individualized processes of infrastructure financialization, the lack of such institutions levelling the playing field exposes underlying mechanisms of obfuscation and financial innovation ‘in the dark’. In using financial ecologies as a tool, we can better understand the impacts of financialization on our cities and analyse not only those occurrences in which forms of financialized investment flow but also those cases where they struggle to take hold. These cases are of particular interest as they expose the line of demarcation by which the financialization process discerns its own viability in the provision of urban water infrastructure.

NOTE

¹ A ‘crore’ refers to a unit equivalent to 10 million in the Indian numbering system.

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